Subject Code: KEC501

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM V) THEORY EXAMINATION 2023-24
INTEGRATED CIRCUITS

TIME: 3 HRS **M.MARKS: 100**

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief.

Q no.	Question	Marks	CO
a.	Write the device parameters for IC 741.	2	1
b.	List the advantages of Widlar current mirror used in IC 741.	2	1
c.	Define 3-dB points in frequency response.	2	2
d.	Discuss the advantages of an instrumentation amplifier.	2	2
e.	Differentiate between voltage comparator and zero crossing detector.	2	3
f.	Analog multiplier can be used as phase detector. Justify the statement.	2	3
g.	Differentiate between PUN and PDN.	2	4
h.	Discuss the advantage of master salve flip flop over simple flip flop.	2	4
i.	Define voltage-controlled oscillator as a system.	2	5
j.	Define Lock range and capture range.	2	5

SECTION B

2. Attempt any *three* of the following:

Q no.	Question	Marks	CO
a.	Calculate the voltages and currents for different transistors used in the input stage of IC 741 through DC analysis of it.	10	1
b.	Derive of impedance offered by generalized impedance converter. Also calculate the values of components to simulate an inductor of 2 $\boldsymbol{mH}$ using it.	10	2
c.	Explain the operation of astable multivibrator using operational amplifier with necessary mathematical expressions and waveforms. Also design a square wave generator using it of frequency **5** $\boldsymbol{KHz}$.	10	3
d.	Discuss the implementation of D flip flop using CMOS inverter along with its master salve configuration.	10	4
e.	Explain the generation of square and triangular wave of IC 566 with its block diagram and waveforms. Also derive the expression of frequency of generated waveform.	10	5

SECTION C

3. Attempt any *one* part of the following:

Q no.	Question	Marks	CO
a.	Draw the overall small signal model of IC 741 and hence calculate the overall voltage gain provided by IC 741.	10	1
b.	Calculate the small signal resistance between node A & A' for following circuit in terms of device parameters.	10	1

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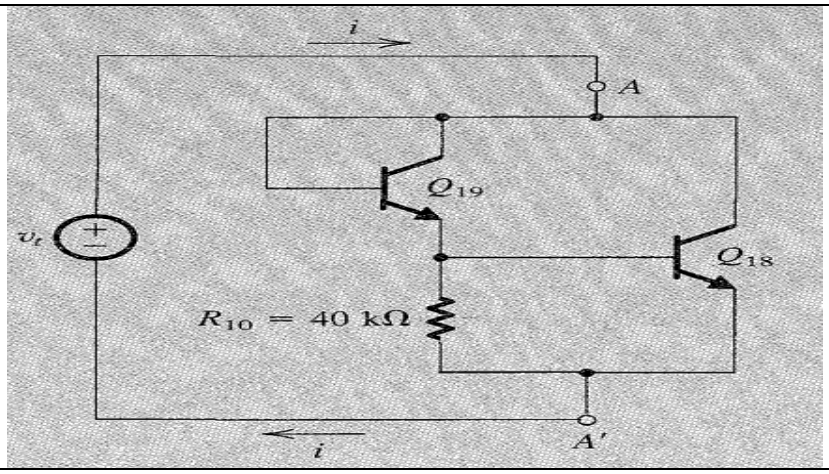

4. Attempt any *one* part of the following:

Q no.	Question	Marks	CO
a.	Derive the transfer functions of low pass, high pass and band pass filters obtained at different nodes of universal active filter or KHN circuit along with their frequency response. Also calculate the bandwidth of bandpass filter, if quality factor is **25** and center frequency is 2 ***KHz***.	10	2
b.	List the properties of V-I and I-V converters. Also discuss the voltage to current converters with floating and grounded load.	10	2

5. Attempt any *one* part of the following:

Q no.	Question	Marks	CO
a.	Discuss the logarithmic amplifier. Also discuss its temperature compensation.	10	3
b.	Discuss the triangular wave generation using operational amplifier. Also derive the expression of frequency of generated triangular waveform.	10	3

6. Attempt any *one* part of the following:

Q no.	Question	Marks	CO
a.	Discuss the realization of clocked SR flip flop using CMOS inverter. Also discuss its simpler implementation using CMOS.	10	4
b.	Implement and verify the followings using CMOS: i. 2 input NAND gate. ii. $Y = \overline{ABC + DE}$	10	4

7. Attempt any *one* part of the following:

Q no.	Question	Marks	CO
a.	Discuss the operation of 555 timer IC as astable multivibrator. Determine the duty cycle and frequency of 555 timer astable operation for $C = .01\ \mu f, R_A = 2.2\ K$ & $R_B = 3.9\ K$.	10	5
b.	Explain the working of PLL with its block diagram. Also discuss the various applications of it.	10	5